

Vapor-Liquid-Liquid Phase Equilibria for 1,1,2,2-Tetrafluoroethane (R134) + Isobutane (R600a)

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The vapor-liquid-liquid phase equilibria (VLLE) of some mixed refrigerants have been found in previous work. In this study, the VLLE data for the binary system of 1,1,2,2-tetrafluoroethane (R134) + isobutane (R600a) were measured at a temperature range from 235.310 K to 241.720 K. The visual apparatus used in this work is based on the circulation method. A self-made magnetic pump was used to drive the vapor phase into the liquid phase. A 25 Ω standard platinum resistance thermometer was used to measure the temperatures of the equilibrium cell. The temperatures in the cell were collected by a Guildline 6622A resistance/thermometry bridge. The pressures in the cell were measured by a Mensor CPT6000 digital pressure transducer with uncertainties of ± 0.00025 MPa. Four capillaries with internal diameter of 0.35 mm were employed for sampling at different elevation in the cell. The compositions of the vapor and liquid phase were analyzed by a gas chromatograph (Shimadzu GC2014). The measured uncertainties of the temperature, pressure, and compositions are ± 5 mK, ± 0.0005 MPa, and ± 0.005 , respectively. All the experimental data were regressed with the polynomial first, and then the experimental and calculated data were correlated with the Peng-Robinson (PR) EoS using the Huron-Vidal (HV) mixing rule involving the non-random two-liquid (NRTL) activity coefficient (PR–HV–NRTL) model. The critical opalescence was observed near the up critical end point (UCEP), and azeotropic behavior was found at the measured temperature range.